Curtis-Straus

Test Report

Report No	EG0814-1
Client	Summit Data Communications, Inc.
Address	526 South Main Street Suite 411 Akron, OH 44311
Phone	330-434-7929
Items tested	SDC-CFG10G
FCC ID	TWG-SDCCF10G
FRN	00144593390
IC	6616A-SDCF10G
Standards	CFR 47 FCC 15.247 & RSS 210 Issue 6 Class II permissive change
Test Dates	July 31st through August 3rd of 2006
Results	As detailed within this report
Prepared by	Mairaj Hussain – Test Engineer
Authorized by	Michael Buchholz – EMC Manager
Issue Date	8/16/06
Conditions of Issue	This Test Report is issued subject to the conditions stated in the '*Conditions of Testing*' section on page 24 of this report.

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Form Final Report REV 6-16-06 (DW)

Summary

This report is an application in pursuit of a class II permissive change for the radio module MN: SDC-CF10G with FCC ID: TWG-SDCCF10G and IC ID: 6616A-SDCF10G operating in the frequency band of 2400MHz – 2483.5MHz under FCC part 15c section 15.247 and RSS-210 Issue 6.

A Class II permissive change is requested because Summit Data Communications wants to add two new antennas to this previously approved radio.

A brief description of antennas is given below. Detailed information regarding antennas is available in exhibits provided with the report.

Antenna Manufacturer	Model Number	Frequency (GHz)	Gain (dBi)
Radiall/Larsen	R.380.500.311	2.4 – 2.5	2
Mobil Mark	p/n: 1000159	2.4 – 2.5	5

The EUT was tested on 80 cm non-conductive foam table according to the procedures specified in ANSI C63.4 (2003). The radio was tested with modulation on and peak and average readings were taken. If a peak reading met the average limit, then the average reading was not taken. Emissions from the EUT antennas were maximized around their axis. Spurious emissions in the restricted bands were checked for both antennas. Furthermore band edges at the restricted bands were checked.

Frequency range investigated:	30MHz – 25GHz

Measurement Distance:		
Frequency (MHz)	***Distance (m)***	***Comments***
30MHz – 18GHz	3m	Radiated Spurious Measurements
18GHz – 25GHz	0.1m	Radiated Spurious

Release Control Record

Issue No.	Reason for change	Date Issued
1	Original Release	August 15, 2006

Summery of Respective Antenna Testing

Frequency (MHz)	Antenna Type			
	5dBi		2dBi	
30 – 1000	X			
1000 – 18000	X		X	
18000 – 25000	X			
Band Edge	2.4GHz	2.4835GHz	2.4GHz	2.4835GHz
802.11b	X	X	X	X
802.11a	X	X	X	X

We found that two new antennas can be used with the radio modules given restrictions are met for power settings as detailed on page 6.

The test sample was received in good condition.

Product Tested - Configuration Documentation

EUT	MN	SN
	SDC-CF10G	CF10G0604290001131
Cable	Type	Length/Shielded
	UFL to SMA	3 m; shielded
	UFL antenna cable	0.1 m; shielded
Support Equipment	HP iPAQ	None
	CFextender	None

Restrictions Required for Compliance

Antenna Type	802.11b	8021.g
5dBi	None	CH1 power set at 60% level
		CH11 power set at 60% level
2dBi	CH1 power set at 75% level	CH1 power set at 50% level
	CH11 power set at 75% level	CH11 power set at 50% level

Test Results

802.11b

5dBi Antenna

Table 1

Radiated Emissions Table — *Curtis-Straus LLC*

Date: 01-Aug-06 **Company:** Summit Data Communication **Work Order:** G0814
Engineer: Mairaj Hussain **EUT Desc:** SDC-CF1OG

Frequency Range: 30 - 1000MHz **Measurement Distance:** 3 m

Notes: 5dBi antenna 802.11b 1mbps RBW: 120KHz VBW: 300KHz Detector: QP **EUT Max Freq:** 2460MHz

Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBµV/m)				FCC Class B Limit (dBµV/m)	FCC Class B Margin (dB)	FCC Class B Result (Pass/Fail)
v	37.58	29.0	26.2	16.5	0.8	20.1				40.0	-19.9	Pass
v	74.16	51.3	26.2	8.7	1.2	35.0				40.0	-5.0	Pass
v	116.8	35.0	26.2	13.4	1.5	23.7				43.5	-19.8	Pass
v	131.0	39.0	26.2	14.6	1.6	29.0				43.5	-14.5	Pass
v	149.95	33.0	26.1	13.0	1.7	21.6				43.5	-21.9	Pass
v	156.86	40.6	26.1	12.8	1.8	29.1				43.5	-14.4	Pass
v	163.96	44.8	26.1	12.6	1.7	33.0				43.5	-10.5	Pass
v	165.66	47.2	26.1	12.5	1.7	35.3				43.5	-8.2	Pass
v	168.1	51.2	26.2	12.4	1.8	39.2				43.5	-4.3	Pass
v	171.22	50.6	26.2	12.1	1.8	38.3				43.5	-5.2	Pass
h	247.43	42.4	26.1	12.3	2.1	30.7				46.0	-15.3	Pass
h	328.9	42.5	26.1	14.6	2.5	33.5				46.0	-12.5	Pass
h	405.96	33.0	26.0	16.2	3.0	26.2				46.0	-19.8	Pass

Test Site: "F" **Pre-Amp:** Orange **Cable:** EMIR-03 **Analyzer:** Green **Antenna:** Red-Black

Table 2

Spurious and Band Edge — *Curtis-Straus LLC*

Date: 31-Jul-06 **Company:** Summit Data Communications **Work Order:** G0814
Engineer: Mairaj Hussain **EUT Desc:** SDC-CF/10G

Frequency Range: 1 - 18GHz **Measurement Distance:** 3 m

Notes: 802.11b 5dBi Antenna RBW: 1MHz VBW: 1MHz & 30Hz **EUT Max Freq:** 2460MHz

Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBµV/m)	--- Limit (dBµV/m)	--- Margin (dB)	--- Result (Pass/Fail)	FCC Class B Limit (dBµV/m)	FCC Class B Margin (dB)	FCC Class B Result (Pass/Fail)
Vpk	2409.0	116.8	39.3	29.8	2.5	109.8						
Vavg	2409.0	114.1	39.3	29.8	2.5	107.1						
300KHZ RBW												
Vpk	2409.0	114.0	39.3	29.8	2.5	107.0						
Vbe	2390.0	60.6	39.4	29.7	2.5	53.4						
Delta:		53.4										
PK @ BE	2390.0	63.4	39.4	29.7	2.5	56.2				74.0	-17.8	Pass
Avg @ BE	2390.0	60.7	39.4	29.7	2.5	53.5				54.0	-0.5	Pass
Vpk	4820.0	54.0	39.3	35.3	3.8	53.8				74.0	-20.2	Pass
Vavg	4820.0	51.6	39.3	35.3	3.8	51.4				54.0	-2.6	Pass
Vpk	7235.0	48.0	39.1	38.2	4.8	51.9				54.0	-2.1	Pass
Upper Band Edge												
Vpk	2460.0	117.0	39.7	29.9	2.6	109.8						
Vavg	2460.0	109.0	39.7	29.9	2.6	101.8						
300KHZ RBW												
Vpk	2460.0	114.7	39.7	29.9	2.6	107.5						
Vbe	2483.5	64.0	39.0	30.0	2.6	57.6						
Delta:		50.7										
PK @ BE	2483.5	66.3	39.0	30.0	2.6	59.9				74.0	-14.1	Pass
Avg @ BE	2483.5	58.3	39.0	30.0	2.6	51.9				54.0	-2.1	Pass

Test Site: F **Pre-Amp:** Brown/HF **Cable:** EMIR-HIGH 10 **Analyzer:** Brown **Antenna:** Orange Horn/HF

Note: No emissions found 18-25GHz range.

2dBi Antenna

Table 3

Band Edge — *Curtis-Straus LLC*

Date: 03-Aug-06 **Company:** Summit Data Communications **Work Order:** G0814
Engineer: Mairaj Hussain **EUT Desc:** SDC-CG10G

Frequency Range: **Measurement Distance:** 3 m

Notes: 802.11b; RBW: 1MHz **EUT Max Freq:** 2460
2dBi antenna VBW: 1MHz & 30Hz

Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBµV/m)	--- Limit (dBµV/m)	--- Margin (dB)	--- Result (Pass/Fail)	FCC Class B Limit (dBµV/m)	FCC Class B Margin (dB)	FCC Class B Result (Pass/Fail)
Set power 75%												
Hpk	2409.0	115.2	39.3	29.8	2.5	108.2						
Havg	2409.0	113.5	39.3	29.8	2.5	106.5						
300KHz RBW												
Hpk	2409.0	113.2	39.3	29.8	2.5	106.2						
Hbe	2389.1	58.0	39.4	29.7	2.5	50.8						
Delta:		55.2										
Pk @ BE	2390.0	60.0	39.4	29.7	2.5	52.8				74.0	-21.2	Pass
Avg @ BE	2390.0	58.3	39.4	29.7	2.5	51.1				54.0	-2.9	Pass

Test Site: "F" **Pre-Amp:** Brown **Cable:** EMIR-HIGH 10 **Analyzer:** Brown **Antenna:** Orange Horn

Table 4

Radiated Emissions Table — *Curtis-Straus LLC*

Date: 03-Aug-06 **Company:** Summit Data Communications **Work Order:** G0814
Engineer: Mairaj Hussain **EUT Desc:** SDC-CG10G

Measurement Distance: 3 m

Notes: 802.11b; Power set 75% RBW: 1MHz **EUT Max Freq:** 2460
2dBi antenna VBW: 1MHz & 30Hz

Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBµV/m)	--- Limit (dBµV/m)	--- Margin (dB)	--- Result (Pass/Fail)	FCC Class B Limit (dBµV/m)	FCC Class B Margin (dB)	FCC Class B Result (Pass/Fail)
802.11b; CH1												
Hpk	2464.0	116.0	39.7	29.9	2.6	108.8						
Havg	2464.0	113.5	39.7	29.9	2.6	106.3						
300KHz RBW												
Hpk	2464.0	113.2	39.7	29.9	2.6	106.0						
Hbe	2487.9	58.2	39.0	30.0	2.6	51.8						
Delta:		55.0										
Pk @ BE	2483.5	61.0	39.0	30.0	2.6	54.6				74.0	-19.4	Pass
Avg @ BE	2483.5	58.5	39.0	30.0	2.6	52.1				54.0	-1.9	Pass

Test Site: "F" **Pre-Amp:** Brown **Cable:** EMIR-HIGH 10 **Analyzer:** Brown **Antenna:** Orange Horn

Restriction: Power set at 75% level for CH1 & CH11.

802.11g

5dBi Antenna

Table 5

Band Edge — *Curtis-Straus LLC*

Date: 03-Aug-06 **Company:** Summit Data Communications **Work Order:** G0814
Engineer: Mairaj Hussain **EUT Desc:** SDC-CG10G

Measurement Distance: 3 m

Notes: RWB: 1MHz **EUT Max Freq:** 2460
5dBi antenna VBW: 1MHz & 30Hz

Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBµV/m)	--- Limit (dBµV/m)	--- Margin (dB)	--- Result (Pass/Fail)	FCC Class B Limit (dBµV/m)	FCC Class B Margin (dB)	FCC Class B Result (Pass/Fail)
Set power to 60% at CH1												
Vpk	2407.0	114.0	39.3	29.8	2.5	107.0						
Vavg	2412.0	107.0	39.4	29.8	2.5	99.9						
300KHZ RBW												
Vpk	2407.0	110.6	39.3	29.8	2.5	103.6						
Vbe	2390.0	62.0	39.4	29.7	2.5	54.8						
Delta:		48.6										
PK @ BE	2390.0	65.4	39.4	29.7	2.5	58.2				74.0	-15.8	Pass
Avg @ BE	2390.0	58.4	39.4	29.7	2.5	51.2				54.0	-2.8	Pass

Test Site: "F" **Pre-Amp:** Brown **Cable:** EMIR-HIGH 10 **Analyzer:** Brown **Antenna:** Orange Horn

Restriction: CH1 power set at 60%

Table 6

Upper Band Edge — *Curtis-Straus LLC*

Date: 03-Aug-06 **Company:** Summit Data Communications **Work Order:** G0814
Engineer: Mairaj Hussain **EUT Desc:** SDC-CG10G

Measurement Distance: 3 m

Notes: RWB: 1MHz **EUT Max Freq:** 2460
5dBi antenna VBW: 1MHz & 30Hz

Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBµV/m)	--- Limit (dBµV/m)	--- Margin (dB)	--- Result (Pass/Fail)	FCC Class B Limit (dBµV/m)	FCC Class B Margin (dB)	FCC Class B Result (Pass/Fail)
Power set 60%												
Vpk	2457.6	114.1	39.7	29.9	2.6	106.9						
Vavg	2456.0	105.0	39.7	29.9	2.6	97.8						
300KHz RBW												
Vpk	2466.1	110.0	39.6	29.9	2.6	102.9						
Vbe	2483.5	60.0	39.0	30.0	2.6	53.6						
Delta:		50.0										
Pk @ BE	2483.5	64.1	39.0	30.0	2.6	57.7				74.0	-16.3	Pass
Avg @ BE	2483.5	55.0	39.0	30.0	2.6	48.6				54.0	-5.4	Pass

Test Site: "F" **Pre-Amp:** Brown **Cable:** EMIR-HIGH 10 **Analyzer:** Brown **Antenna:** Orange Horn

Restriction: CH11 power set at 60%

2dBi Antenna

Table 7

Lower Band Edge — *Curtis-Straus LLC*

Date: 03-Aug-06 **Company:** Summit Data Communications **Work Order:** G0814
Engineer: Mairaj Hussain **EUT Desc:** SDC-CG10G

Measurement Distance: 3 m

Notes: Power set 50% RWB: 1MHz **EUT Max Freq:** 2460
2dBi antenna VBW: 1MHz & 30Hz

Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBµV/m)	--- Limit (dBµV/m)	--- Margin (dB)	--- Result (Pass/Fail)	FCC Class B Limit (dBµV/m)	FCC Class B Margin (dB)	FCC Class B Result (Pass/Fail)
802.11g; CH1			---	---	---	---						
Hpk	2407.0	114.8	39.3	29.8	2.5	107.8						
Havg	2407.0	108.0	39.3	29.8	2.5	101.0						
300KHz RBW			---	---	---	---						
Hpk	2407.0	110.7	39.3	29.8	2.5	103.7						
Hbe	2390.0	63.2	39.4	29.7	2.5	56.0						
Delta:		47.5										
Pk @ BE	2390.0	67.3	39.4	29.7	2.5	60.1				74.0	-13.9	Pass
Avg @ BE	2390.0	60.5	39.4	29.7	2.5	53.3				54.0	-0.7	Pass

Test Site: "F" **Pre-Amp:** Brown **Cable:** EMIR-HIGH 10 **Analyzer:** Brown **Antenna:** Orange Horn

Table 8

Upper Band Edge — *Curtis-Straus LLC*

Date: 03-Aug-06 **Company:** Summit Data Communications **Work Order:** G0814
Engineer: Mairaj Hussain **EUT Desc:** SDC-CG10G

Measurement Distance: 3 m

Notes: RWB: 1MHz **EUT Max Freq:** 2460
2dBi antenna VBW: 1MHz & 30Hz

Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBµV/m)	--- Limit (dBµV/m)	--- Margin (dB)	--- Result (Pass/Fail)	FCC Class B Limit (dBµV/m)	FCC Class B Margin (dB)	FCC Class B Result (Pass/Fail)
Power set 50%												
Hpk	2463.9	114.0	39.7	29.9	2.6	106.8						
Havg	2464.0	106.0	39.7	29.9	2.6	98.8						
300KHz RBW												
Hpk	2466.1	110.0	39.6	29.9	2.6	102.9						
Hbe	2483.5	61.8	39.0	30.0	2.6	55.4						
Delta:		48.2										
Pk @ BE	2483.5	65.8	39.0	30.0	2.6	59.4				74.0	-14.6	Pass
Avg @ BE	2483.5	57.8	39.0	30.0	2.6	51.4				54.0	-2.6	Pass

Test Site: "F" **Pre-Amp:** Brown **Cable:** EMIR-HIGH 10 **Analyzer:** Brown **Antenna:** Orange Horn

Restriction: Power set for CH1 & CH11 at 50% level

Table 9

Spurious Emissions — *Curtis-Straus LLC*

Date: 03-Aug-06 **Company:** Summit Data Communications **Work Order:** G0814
Engineer: Mairaj Hussain **EUT Desc:** SDC-CG10G

Frequency Range: 1 - 18GHz Restricted Band **Measurement Distance:** 3 m

Notes: VBW: 1MHz **EUT Max Freq:** 2460
2dBi antenna RBW:1MHz

Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBµV/m)	---	---	---	FCC Class B Limit (dBµV/m)	FCC Class B Margin (dB)	FCC Class B Result (Pass/Fail)
802.11b & g												
Hpk	4924.3	51.0	39.0	35.6	3.8	51.4				54.0	-2.6	Pass

Table Result: Pass by -2.6 dB ***Worst Freq:*** 4924.3 MHz

Test Site: "F" **Pre-Amp:** Brown **Cable:** EMIR-HIGH 10 **Analyzer:** Brown **Antenna:** Orange Horn

Test Descriptions

Radiated Emissions Testing Overview

REV 22-SEP-05

Digital and microprocessor based devices use radio frequency (RF) digital signals for timing purposes. An unintentional consequence of this signal usage is that a certain amount of RF energy is radiated from the device into the local environment. This radiated RF energy has the potential to interfere with constructive uses of the RF spectrum such as television broadcasting, police and fire radio, and the like. In order to reduce the likelihood that a device will interfere with these services, it is required that the amplitudes of radiated RF signals from the device are kept below an allowable level.

These RF signals decrease in strength as the distance from the source increases. Thus if the potential victim of interference, e.g. a TV receiver, is far enough from the radiator, e.g. a computer, then no interference will occur. For certain environments it is appropriate to expect that potential interference victims will be located at least a minimum distance from the radiator. For the residential environment this distance is generally accepted to be 10 meters while in the commercial environment the accepted distance is 30 meters. The allowable emissions levels are therefore specified to protect equipment which is located further than that distance from the radiator. In general, radiation from the Equipment Under Test (EUT) is measured at 3 or 10 meters to insure that it is at or below allowable levels.

Measurements of the radiated energy are made by recording the field strength indicated by an antenna placed at a specific distance from the device. Most devices do not radiate the RF energy in a predictable manner. The emitted energy may vary with changes in operating mode, physical configuration, or orientation. During the measurement process these parameters are varied to confirm that the emissions will remain below the allowable levels in the range of typical installations.

The extent of annoyance experienced by a person who is being affected by interference is related to the persistence of the interfering signal. For example, a low level steady whine from a receiver is considered to be more annoying than brief, loud, intermittent pops or clicks. This “human factor” is accounted for by the use of a “quasi-peak” detector in the receiver or spectrum analyzer which measures the signal from the measurement antenna. The detector is a weighted averaging filter with a fast charge time and a slow discharge time. Thus steady continuous signals will charge the quasi-peak detector fully while intermittent signals (those with pulse repetition rates less than 1kHz) are reported at a level which can be significantly below their peak level. It should be noted that most RF signals produced by digital devices are continuous in nature and thus the quasi-peak reading will be identical to the peak signal reading. To reduce the test time, the peak emission level is recorded for continuous wave signals as it is the same as the quasi-peak signal level.

Testing is performed according to test methods from ANSI C63.4 and CISPR 22.

The test site used for measuring radiated emissions follows the format developed internationally for a weather protected Open Area Test Site (OATS). An antenna mast is

installed at the specified distance from a rotating table and is used to raise and lower the measuring antenna. The reference site is clear of reflecting objects, such as metal fences and buildings for an ellipse of twice the measurement test distance. Measuring equipment and personnel are present within the ellipse to facilitate cable manipulation, but measures are taken to minimize the effects. Often preliminary radiated emissions measurements are made at alternate test sites which do not meet the clear space reference criteria. The data collected at alternate test sites is not considered conclusive unless the alternate site also complies with a volumetric site attenuation survey performed over the area that the EUT occupies. The EUT and measuring antenna mark the two foci of the ellipse. The ground plane is made of a combination of galvanized steel sheets and tight wire mesh electrically connected along the seams. This metal ground plane extends 1 meter beyond the furthest extent of the EUT and the measuring antenna. It also covers the area between the EUT and the measuring antenna. The hardware cloth is connected to the utility ground or to stakes driven into the earth for safety.

In order for accurate emissions measurements to be made the test site must possess propagation characteristics which fall within accepted norms. The site has been checked for suitability using techniques specified in American National Standards Institute (ANSI) document C63.4. This document details a procedure which measures the attenuation of the site which is the chief indicator of site acceptability. The theory behind site attenuation is quite simple. A transmitting antenna is set up at a fixed location at one end of the site with a receiving antenna at the other end. If a signal of some arbitrary amplitude is fed into the transmitting antenna, a lesser amount of signal ought to be measured at the receiving antenna. This difference in signal amplitude is known as the site attenuation, which should follow a predicted curve. Data that does not correspond to the predicted site attenuation curve points to a problem with either the equipment being used or the physical characteristics of the site.

Actual emissions measurements are taken with broadband biconical-log-periodic hybrid antennas calibrated in accordance with the standard site method detailed in ANSI C63.5. Emissions are measured with the receiving antenna oriented in horizontal and vertical polarization with respect to the ground plane. If measurements are made at other than the limit distance, then the readings obtained are scaled to the limit distance using an inverse relationship. The actual test distance used is noted in the report.

The antenna mast is capable of a varying the antenna height between 1 and 4 meters above the ground plane. The receiving antenna is moved over this range at each emission frequency in order to record the maximum observed signal. The mast is non-conductive and remotely controllable. The test distance is measured from the antenna center (marked during calibration) and the periphery of the EUT.

The Equipment Under Test (EUT) is rotated in order to maximize emissions during the test. For equipment intended to operate on a tabletop or desk radiated tests are conducted on a 0.8 meter high, non-conductive platform. Larger floor standing equipment is tested on a floor mounted rotatable platform. In some cases, large equipment on its own casters may be tested without a platform.

Since radiated emissions are a function of cable placement, the cable placement is varied to encompass typical configurations that an end user might encounter to determine the configuration resulting in maximum emissions. At least one cable for each I/O port type is

attached to the EUT. If peripherals or modules are available, at least one of each available type is installed and noted in the report. Excess cable length beyond one meter is bundled in the center into a 30 to 40 cm bundle. Cables requiring non-standard lead dress are recorded in the report.

Network connections are simulated if necessary. Any simulator used matches the expected real network connection in terms of both functionality and impedance. For distributed systems, the support equipment may be placed at such a distance that it does not influence the measured emissions. If this option is used, such placement is noted in the test report.

The possible operating modes of the EUT are explored to determine the configuration which maximizes emissions. Software is investigated as well as different methods of displaying data if available. Data is recorded in the worst case operating mode.

At least the six highest emissions with respect to the limit are recorded. If less than six emissions are visible above the noise floor of the instrumentation, then noise floor measurements at six representative frequencies are recorded. The test report will document if noise floor readings are reported.

FCC and European Norms Radiated Emissions Limits at 10 meters

Frequency (MHz)	FCC Class A	FCC Class B	CISPR Class A	CISPR Class B	Frequency (MHz)
30-88	39.1	29.5	40	30	30-88
88-216	43.5	33.1	40	30	88-216
216-230	46.4	35.6	40	30	216-230
230-960	46.4	35.6	47	37	230-960
960-1000	49.5	43.5	47	37	960-1000
1000+	49.5	43.5	N/A	N/A	1000+

At the transitions, the lower limit applies.
Simple inverse scaling utilized to convert limits where appropriate.

FCC and European Norms Radiated Emissions Limits at 3 meters

Frequency (MHz)	FCC Class A	FCC Class B	CISPR Class A	CISPR Class B	Frequency (MHz)
30-88	49.5	40	50.5	40.5	30-88
88-216	54	43.5	50.5	40.5	88-216
216-230	56.9	46	50.5	40.5	216-230
230-960	56.9	46	57.5	47.5	230-960
960-1000	60	54	57.5	47.5	960-1000
1000+	60	54	N/A	N/A	1000+

At the transitions, the lower limit applies.
Simple inverse scaling utilized to convert limits where appropriate.

For CISPR and EU standards measurements are usually made over the frequency range of 30 MHz to 1GHz. Deviations are noted in the test report. For the FCC, the measurement range is based on the highest frequency signal present or used in the device. The following table details the frequency range of measurements performed.

FCC frequency range of radiated emissions measurements	
Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30 (No radiated measurements)
1.705-108	1000
108-500	2000
500-1000	5000
Above 1000	5^{th} harmonic of the highest frequency or 40 GHz, whichever is lower.

The test data is derived from the voltage on the spectrum analyzer. First the reading is corrected for gain factors associated with the use of preamps and loss in the cable. A factor in dB is subtracted from the reading to account for preamp gain, while a factor in dB is added to the signal to account for cable loss. A conversion is performed from the resulting voltage to field strength by multiplying the voltage by the antenna factor. Since antenna factor is expressed as a logarithm (dB/m), this operation takes the form of an addition (to multiply logarithmic numbers, you add them together). Thus:

Field Strength (dBuV/m) = Voltage Reading (dBuV) - Preamp Gain (dB) + Cable Loss (dB) + Antenna Factor (dB/m)

When the levels of ambient radio signals such as local television stations are within 6 dB of the appropriate limit, the following steps may be taken to assure compliance:

1. The measurement bandwidth may be reduced. A check is made to see that peak readings are not affected. The use of a narrower bandwidth allows examination of emissions close to local ambient signals.
2. The antenna may be brought closer to the EUT to increase signal-to-ambient signal strength.
3. For horizontally polarized signals the axis of the test site may be rotated to discriminate against local ambients.

Standard Uncertainty per NIST Technical Note 1297 1994 for this test is estimated to be 2.8dB. This test method is covered by our A2LA accreditation.

Line Conducted Emissions Overview

REV 9-MAY-06

Digital and microprocessor based devices use radio frequency (RF) digital techniques for timing purposes and in applications such as switching power supplies. An unintentional consequence of this for AC powered devices is that a certain amount of the RF energy is impressed upon the AC power mains in the form of a conducted noise voltage. These

conducted emissions have the potential to interfere with constructive uses of the RF spectrum such as AM radio and may also interfere with other devices attached to the same AC mains circuit. In order to reduce the likelihood that a device will interfere it is required that the conducted RF signals from the device are below an allowable level.

Testing is performed according to test methods from ANSI C63.4 and CISPR 22.

Line conducted emissions are measured from the device over the frequency range of 0.15 to 30 MHz. The EUT is powered from a Line Impedance Stabilization Network (LISN). The purpose of the LISN is to provide a calibrated impedance across which to measure the conducted emissions. The RF noise voltage produced by the EUT across the LISN is measured and compared to the limit. In order for the LISN to perform properly it is attached to a ground plane at least 2 meters by 2 meters in size. For tabletop equipment the measurement is performed with the equipment 40 cm from a vertical conducting surface bonded to a ground plane under the product. The ground plane extends 0.5 meters beyond the product and is 2.5mx3.7m in size. The vertical surface is 2.5mx2.5m.

As with radiated emissions, the "human factor" is accounted for by the use of a "quasi-peak" detector in the receiver or spectrum analyzer that measures the signal from the LISN. For certain tests (such as EN55022), both an average and a quasi-peak limit are specified. Emissions from a device must be below both limits when measured with the appropriate detector. If the emission level is below the average limit when measured with the quasi-peak detector, the EUT is presumed to pass both limits.

The possible operating modes of the EUT are explored to determine the configuration that maximizes emissions. Software is investigated as well as different methods of displaying data if available. Data is recorded in the worst case operating mode.

As of September 9, 2002, the FCC has harmonized it's conducted emission limits with CISPR. The following table displays the limits applicable to both FCC and CISPR.

Line Conducted Emissions Limits: Class A (dBµV)		
Frequency (MHz)	Quasi-Peak	Average
0.15 - 0.5	79	66
0.5 - 30	73	60
Line Conducted Emissions Limits: Class B (dBµV)		
Frequency (MHz)	Quasi-Peak	Average
0.15 - 0.5	66 - 56*	56 - 46*
0.5 - 5	56	46
5 - 30	60	50
Note 1: The lower limit applies at the transition frequencies		
*Note 2: The limit decreases linearly with the logarithm of the frequency		

At least the six highest emissions with respect to the limit are recorded. If less than six emissions are visible above the noise floor of the instrumentation, then the noise floor at six representative frequencies is recorded. The test report will document if noise floor readings are reported.

Standard Uncertainty per NIST Technical Note 1297 1994 for this test is estimated to be 2dB.

All testing is performed within the framework of a laboratory quality system modeled on ISO/IEC 17025 *General requirements for the competence of calibration and testing laboratories* and is subject to our terms and conditions. This test method is covered by our A2LA accreditation.

Test Equipment Used

REV. 28-JUL-2006

SPECTRUM ANALYZERS / RECEIVERS	RANGE	MN	MFR	SN	ASSET	CAT	CALIBRATION DUE
RED	9kHz-1.8GHz	8591E	HP	3441A03559	00024	I	30-DEC-2006
WHITE	9kHz-22GHz	8593E	HP	3547U01252	00022	I	14-MAR-2007
BLUE	9kHz-1.8GHz	8591E	HP	3223A00227	00070	I	14-DEC-2006
YELLOW	9kHz-2.9GHz	8594E	HP	3523A01958	00100	I	05-JUN-2007
GREEN	9kHz-26.5GHz	8593E	HP	3829A03618	00143	I	21-NOV-2006
BLACK	9kHz-12.8GHz	8596E	HP	3710A00944	00337	I	02-NOV-2006
TELECOM 3585A	20Hz-40.0MHz	3585A	HP	2504A05219	00030	I	07-FEB-2007
TELECOM 3585A	20Hz-40.0MHz	3585A	HP	1750A03418	00558	1	23-MAY-2007
TELECOM 3585A	20Hz-40.0MHz	3585A	HP	1750A02762	01067	I	01-MAR-2007
ORANGE	9kHz-26.5GHz	E4407B	HP	US39440975	00394	I	Out of Service
BROWN (RENTAL)	9kHz-26.5GHz	E4407B	HP	SG44210511	Rental	1	05-JAN-2007
EMI TEST RECEIVER	20-1000MHz	ESVS30	R&S	827957/001	01098	I	27-OCT-2006

LISNS/MEASUREMENT PROBES	RANGE	MN	MFR	SN	ASSET	CAT	CALIBRATION DUE
RED	10kHz-30MHz	8012-50-R-24-BNC	SOLAR	956348	00753	II	05-MAY-2007
BLUE (DC)	10kHz-30MHz	8012-50-R-24-BNC	SOLAR	956349	00752	II	05-MAY-2007
YELLOW-BLACK	10kHz-30MHz	8012-50-R-24-BNC	SOLAR	984735	00248	II	05-MAY-2007
ORANGE	10kHz-30MHz	8012-50-R-24-BNC	SOLAR	903707	00754	II	05-MAY-2007
GOLD (DC)	10kHz-30MHz	8012-50-R-24-BNC	SOLAR	984734	00247	II	05-MAY-2007
BROWN	10kHz-30MHz	8012-50-R-24-BNC	SOLAR	0411656	00986	II	05-MAY-2007
GREEN	10kHz-30MHz	8012-50-R-24-BNC	SOLAR	0411657	00987	II	08-MAY-2007
YELLOW	10kHz-30MHz	8012-50-R-24-BNC	SOLAR	0411658	1080	II	05-MAY-2007
WHITE-BLACK	10kHz-30MHz	8610-50-TS-100-N	SOLAR	972019	00678	II	05-MAY-2007
BLACK	10kHz-30MHz	8610-50-TS-100-N	SOLAR	972017	00675	II	05-MAY-2007
RED-BLACK	10kHz-30MHz	8610-50-TS-100-N	SOLAR	972016	00677	II	05-MAY-2007
BLUE-BLACK	10kHz-30MHz	8610-50-TS-100-N	SOLAR	972018	00676	II	05-MAY-2007
BLUE MONITORING PROBE	0.01-150MHz	91550-2	TEGAM	12350	00807	I	26-MAY-2007
YELLOW MONITORING PROBE	0.01-150MHz	91550-2	ETS	50972	00493	I	23-JAN-2008
GREEN CURRENT TRANSFORMER	40Hz-20MHz	150	PEARSON	10226	00793	I	07-APR-2007
BLUE CISPR LINE PROBE	150kHz-30MHz	N/A	C-S	N/A	00805	II	08-JUN-2007
BLACK CISPR LINE PROBE	150kHz-30MHz	N/A	C-S	N/A	NONE	II	08-JUN-2007
CISPR TELCO VOLTAGE PROBE	10kHz-30MHz	CS A/C-10	C-S	CS01	00296	II	30-SEP-2006
CISPR 22 TELCO ISN	9kHz-30MHz	FCC-TLISN-T4	FISCHER	20115	00746	I	26-OCT-2006

OPEN AREA TEST SITE (OATS)	FCC CODE	IC CODE	VCCI CODE	CAT	CALIBRATION DUE
SITE F	93448	IC 2762-F	R-1688	II	04-APR-2007
SITE T	93448	IC 2762-T	R-905	II	14-AUG-2007
SITE A	93448	IC 2762-A	R-903	II	13-AUG-2007
SITE M	93448	IC 2762-M	R-904	II	19-MAR-2007
SITE J	93448	IC 2762A-10		II	11-APR-2008

LINE CONDUCTED TEST SITES	FCC CODE	IC CODE	VCCI CODE	CAT	CALIBRATION DUE
EMI 1	93448	N/A	C-1801	III	NA
EMI 2	93448	N/A	C-1802	III	NA
EMI 3	93448	N/A	C-1803	III	NA

MIXERS/DIPLEXERS	RANGE	MN	MFR	SN	ASSET	CAT	CALIBRATION DUE
MIXER / HORN	26.5-40 GHz	11970A/28-442-6	HP/ATM	2332A01695/A046903-01	1087	I	23-AUG-2006
MIXER / HORN	26.5-40 GHz	11970A/28-442-6	HP/ATM	3003A07825/A046903-01	1086	I	23-AUG-2006
MIXER / HORN	40-60 GHz	M19HW/A	OML	U30110-1	00821	I	02-MAR-2007
MIXER	33-50 GHz	11970Q	HP	3003A03155	00104	I	08-NOV-2007
MIXER / HORN	50-75 GHz	11970V /QWH-VPRROO	HP/QUINSTAR	2521A01197/8794001	1179	I	15-NOV-2007
MIXER	75-110 GHz	11970W	HP	2521A01334	00105	I	22-NOV-2007
MIXER / HORN	60-90 GHz	M12HW/A	OML	E30110-1	00822	I	03-MAR-2007
MIXER / HORN	90-140 GHz	MO8HW/A	OML	F21206-1	00811	I	03-MAR-2007
MIXER / HORN	140-220 GHz	MO5HW/A	OML	G21206-1	00812	II	
DIPLEXER	40-220 GHz	DPL.26	OML	N/A	00813	I	03-MAR-2007

ABSORBING CLAMPS	RANGE	MN	MFR	SN	ASSET	CAT	CALIBRATION DUE
FISCHER CLAMP	30-1000MHZ	F-201-23MM	FISCHER	10	00081	I	20-JAN-2008

HARMONIC & FLICKER ANALYZER	MN	MFR	SN	ASSET	CAT	CALIBRATION DUE
HFTS	HP6842A	HP	3531A-00169	00738	II	30-DEC-2007
10001I/2 AC POWER SYSTEM	(2) 500I	CALIFORNIA INSTRUMENTS	HK53687/HK53688	00376	II	09-JAN-2008

PREAMPS / ATTENUATORS / FILTERS	RANGE	MN	MFR	SN	ASSET	CAT	CALIBRATION DUE
RED	0.10-2000MHZ	ZFL-1000-LN	C-S	N/A	00798	II	28-JUL-2007
BLUE	0.01-2000MHZ	ZFL-1000-LN	C-S	N/A	00759	II	20-JUL-2007
BLUE-BLACK	0.01-2000MHZ	ZFL-1000-LN	C-S	N/A	00800	II	04-JAN-2007
GREEN	0.01-2000MHZ	ZFL-1000-LN	C-S	N/A	00802	II	20-JUL-2007
BLACK	0.01-2000MHZ	ZFL-1000-LN	C-S	N/A	00799	II	20-JUL-2007
ORANGE	0.01-2000MHZ	ZFL-1000-LN	C-S	N/A	00765	II	28-DEC-2006
WHITE	1-20GHZ	SMC-12A	C-S	426643	00760	II	22-JUL-2007
BROWN	1-20GHZ	PM2-38-218-4R5-17-15-SFF	C-S	PL1655	1132	II	14-APR-2007
YELLOW-BLACK	1-20GHZ	SMC-12A	C-S	535055	00801	II	22-JUL-2007
RED-GREEN	1-20GHZ	PM2-38-218-4R5-17-15-SFF	C-S			II	30-MAY-2007
HF (YELLOW)	18-26.5GHZ	AFS4-18002650-60-8P-4	C-S	467559	00758	II	23-AUG-2007
HIGH PASS FILTER	1-18 GHZ	SPA-F-55204	K&L	36	00817	II	05-JAN-2008
LOW PASS FILTER	1-9 GHZ	11SL10-4100/X4400-O/O	K&L	4	00816	II	05-JAN-2008
HF 20DB 50W ATTENUATOR	0.03-20 GHZ	PE 7019-20	PASTERNACK	01	00791	II	10-MAY-2007
HF 30DB 50W ATTENUATOR	0.03-20 GHZ	PE 7019-30	PASTERNACK	02	1168	II	10-MAY-2007
LOW FREQ LPF	10-100KHZ	L200K1G1	MICROWAVE CIRCUITS	4460-01 DC0432	1019	II	OUT OF SERVICE
LOW FREQ LPF	10-100KHZ	L200K1G1	MICROWAVE CIRCUITS	4777-01 DC0434	1088	II	OUT OF SERVICE

ANTENNAS	RANGE	MN	MFR	SN	ASSET	CAT	CALIBRATION DUE
GREEN BILOG	30-2000MHZ	CBL6112B	CHASE	2742	00620	II	13-JAN-2008
GREEN-BLACK BILOG	30-2000MHZ	CBL6112B	CHASE	2412	00127	II	13-JAN-2008
GREEN-RED BILOG	30-2000MHZ	CBL6112B	CHASE	2435	00990	I	12-APR-2008
BLUE BILOG	30-1000MHZ	3143	EMCO	1271	00803	II	06-MAY-2007
GRAY BILOG	20-2000MHZ	3141	EMCO	9703-1038	00066	II	06-MAY-2007(EMI) / 30-JUN-2007(RFI2)
YELLOW-BLACK BILOG	20-2000MHZ	CBL6140A	CHASE	1112	00126	II	06-MAY-2007(EMI) / 01-MAY-2007(RFI)
RED-WHITE BILOG	30-2000MHZ	JB1	SUNOL	A091604-1	01105	II	11-APR-2008
RED-BLACK BILOG	30-2000MHZ	JB1	SUNOL	A091604-2	01106	II	11-APR-2008
RED-BROWN BILOG	30-2000MHZ	JB1	SUNOL	A0032406	1218	I	30-MAR-2008
YELLOW HORN	1-18GHZ	3115	EMCO	9608-4898	00037	I	27-MAY-2007(EMI) / 18-MAY-2007 (RFI)
BLACK HORN	1-18GHZ	3115	EMCO	9703-5148	00056	I	17-JUN-2007
ORANGE HORN	1-18GHZ	3115	EMCO	0004-6123	00390	I	09-JUN-2007
HF (WHITE) HORN	18-26.5GHZ	801-WLM	WAVELINE	00758	00758	I	26-AUG-2007
SMALL LOOP	10KHZ-30MHZ	PLA-130/A	ARA	1024	00755	I	22-FEB-2008
LARGE LOOP	20HZ-5MHZ	6511	EMCO	9704-1154	00067	I	23-JAN-2008
ACTIVE MONOPOLE	30HZ-30MHZ	3301B	EMCO	3824	00068	II	07-APR-2007
INDUCTION COIL	50-60HZ	1000-4-8	C-S	N/A	00778	II	26-SEP-2007
ADJUSTABLE DIPOLE	30-1000MHZ	3121C	EMCO	1370	00757	II	18-MAR-2007
ADJUSTABLE DIPOLE	30-1000MHZ	3121C	EMCO	1371	00756	II	18-MAR-2007
RE101 LOOP SENSOR	30HZ-100KHZ	RE101-13.3CM	C-S	N/A	00818	II	13-MAR-2007
RS101 RADIATING LOOP	30HZ-100KHZ	RS101-12CM	C-S	N/A	00819	II	13-MAR-2007
RS101 LOOP SENSOR	30HZ-100KHZ	RS101-4CM	C-S	N/A	00820	II	13-MAR-2007

EFT	MN	MFR	SN	ASSET	CAT	CALIBRATION DUE
EFT DIRECT COUPLING CAP	N/A	C-S	01	00794	II	06-FEB-2008

ESD GENERATORS	MN	MFR	SN	ASSET	CAT	CALIBRATION DUE
GREEN	NSG435	SCHAFFNER	000839	00763	I	02-MAR-2007
RED	NSG435	SCHAFFNER	001625	00762	I	06-JAN-2007
YELLOW	930D	ETS	201	00673	I	18-AUG-2007

BEST EMC-2	MN	MFR	SN	ASSET	CAT	CALIBRATION DUE
BLUE	711-1100	SCHAFFNER	199824-002SC	00117	II	05-JUN-2007 (SURGE) / 03-AUG-2006 (D+I) / 05-AUG-2006 (EFT)
RED	711-1100	SCHAFFNER	200122-074SC	00623	II	31-MAR-2007 (SURGE / D+I) / 07-APR-2007 (EFT)

CHAMBERS AND STRIPLINE	MN	MFR	SN	ASSET	CAT	CALIBRATION DUE
RFI 1 CHAMBER	3 METER COMPACT	PANASHIELD	N/A	00797	II	01-MAY-2007
RFI 2 CHAMBER	04' X 07' SHIELDING SYSTEM	LINDGREN	13329	00795	II	30-JUN-2007
RFI 3 STRIPLINE	N/A	C-S	N/A	00796	III	NA
ENVIRONMENTAL (SAFETY)	ECL5	B-M-A INC.	2041	00029	I	11-JAN-2007
ENVIRONMENTAL (SAFETY)	SGTH-31S	B-M-A INC.	2245	00321	I	11-JAN-2007

AMPLIFIERS	RANGE	MN	MFR	SN	ASSET	CAT	CALIBRATION DUE
RED	0.5-1000MHZ	10W1000B	AR	18708	00032	II	26-APR-2007 (RFI1)
GREEN	0.5-1000MHZ	10W1000B	AR	23423	00123	II	13-APR-2007 (RFI2)
BLUE	0.01-250MHZ	75A250	AR	19165	00039	II	05-APR-2007 (EUCRFI) / 12-DEC-2006 (NEBS CRFI)
BLACK	0.01-250MHZ	75A250	AR	23411	00122	II	05-APR-2007 (EU CRFI) / 12-DEC-2006 (NEBS CRFI)
ORANGE	0.01-250MHZ	75A250	AR	26827	00367	II	05-APR-2007 (EU CRFI) / 12-DEC-2006 (NEBS CRFI)/ 01-MAY-2007 (RFI1)
BROWN 150W	0.1-250MHZ	150A250	AR	313454	RENTAL	II	30-JUN-2007 (RFI2)
GTC 1-2.6	1.0-2.6 GHZ	GRF5016A	GTC	1221	RENTAL	II	18-MAY-2007
HUGHES 10W	2.0-4.0GHZ	1177H01	HUGHES	055	RENTAL	II	18-MAY-2007
HUGHES 10W	4.0-8.0GHZ	8010H02F	HUGHES	240	RENTAL	II	18-MAY-2007
HUGHES 10W	8-10.0GHZ	80108	HUGHES	138	RENTAL	II	18-MAY-2007
HP495A	7.0-10.0GHZ	HP495A	HP	304-00237	00086	II	OUT OF SERVICE (SPARE)
AUDIO AMP	AUDIO FREQ	MPA-200	RADIO SHACK	700438	NONE	III	NA
AUDIO AMP	AUDIO FREQ	MPA-200	RADIO SHACK	708545	00862	III	NA

FIELD PROBES	RANGE	MN	MFR	SN	ASSET	CAT	CALIBRATION DUE
RED	0.01-1000MHZ	HI-4422	HOLADAY	90369	00031	I	01-MAR-2007
GREEN	0.01-1000MHZ	HI-4422	HOLADAY	97363	00136	I	25-JUL-2007
BLUE	0.01-1000MHZ	HI-4422	HOLADAY	95696	01100	I	25-MAR-2007

SIGNAL GENERATORS	RANGE	MN	MFR	SN	ASSET	CAT	CALIBRATION DUE
RED	0.09-2000MHZ	HP8648B	HP	3847U02192	00366	I	28-FEB-2007
BLUE	0.1-1000MHZ	HP8648A	HP	3426A00548	00034	I	25-AUG-2006
GREEN	0.09-2000MHZ	HP8648B	HP	3623A02072	00125	I	17-OCT-2006
ORANGE	0.1-1000MHZ	HP8648B	HP	3537A01210	00025	I	29-JUN-2007
BROWN	0.01HZ-15MHZ	HP33120A	HP	US36016621	1211	I	23-NOV-2006
WHITE (NEW)	0.01HZ-15MHZ	HP33120A	HP	US36048143	1219	1	10-MAY-2007
BLUE-WHITE	0.1HZ-13MHZ	HP3312A	HP	1432A07632	00775	I	11-MAR-2007
SWEEPER	0.01-20.0GHZ	HP83752A	HP	3610A01133	00087	II	02-MAY-2007
AM/FM STEREO SIG. GEN.	0.1-170MHZ	LG3236	LEADER	3687301	00959	I	30-AUG-2006
IMPULSE GENERATOR	1-100HZ	CIG-25	ELECTRO-METRICS	290	00942	I	05-AUG-2006

BULK INJECTION CLAMPS	RANGE	MN	MFR	SN	ASSET	CAT	CALIBRATION DUE
GREEN	0.01-100MHZ	95236-1	ETS	50215	00118	II	05-APR-2007 (EU) /16-DEC-2006 (NEBS)
RED	0.01-100MHZ	95236-1	ETS	34026	1020	II	05-APR-2007 (EU) /16-DEC-2006 (NEBS)

CDN NETWORKS	RANGE	MN	MFR	ASSET	CAT	CALIBRATION DUE
BLACK	0.10-100MHZ	20A M-2 (DC)	C-S	00783	II	OUT OF SERVICE
BLUE	0.10-100MHZ	15A M-3	C-S	00806	II	10-JAN-2007
ORANGE	0.10-100MHZ	15A M-2	C-S	00786	II	OUT OF SERVICE
RED	0.10-100MHZ	15A M-3	C-S	00780	II	10-JAN-2007
WHITE	0.10-100MHZ	15A M-3	C-S	00782	II	OUT OF SERVICE
YELLOW-BLACK	0.10-100MHZ	15A M-3	C-S	00784	II	10-JAN-2007
GREEN	0.10-100MHZ	30A M-3	C-S	00779	II	OUT OF SERVICE
YELLOW	0.10-100MHZ	30A M-5	C-S	00804	II	05-APR-2007
BLUE-WHITE	0.10-100MHZ	15A M-5	C-S	00788	II	OUT OF SERVICE
BROWN	0.10-100MHZ	M-3	C-S	1169	II	10-JAN-2007
BROWN-WHITE	0.10-100MHZ	M-3	C-S	1170	II	10-JAN-2007
BROWN-BLACK	0.10-100MHZ	M-2 (DC)	C-S	1171	II	10-JAN-2007
RED-BLACK	0.10-100MHZ	M-2 (DC)	C-S	1177	II	11-MAY-2007
YELLOW (RES)	0.10-100MHZ	100Ω RESISTOR NWK (M-1)	C-S	00810	II	05-OCT-2006
GREEN (RES)	0.10-100MHZ	100Ω RESISTOR NWK (M-1)	C-S	1172	II	30-JAN-2007

ANSI T1.315	MN	MFR	SN	ASSET	CAT	CALIBRATION DUE
SBC NOISE CART		C-S			III	CALIBRATION NOT REQUIRED
SBC TRANSIENT CART		C-S			III	WAVESHAPE VERIFIED BEFORE USE

OSCILLOSCOPES	MN	MFR	SN	ASSET	CAT	CALIBRATION DUE
EMC 100MHZ	TDS 220	TEKTRONIX	C036986	1166	I	26-AUG-2006
ESD REFERENCE 1GHZ	TDS 684B	TEKTRONIX	B011287	RENTAL	1	31-MAR-2007
PRODUCT SAFETY 100 MHZ	TDS 340	TEKTRONIX	B012357	00737	I	06-OCT-2006
TELECOM 100 MHZ	54645A	HP/AGILENT	US36320452	00103	I	30-JUN-2007

RMS VOLTMETERS/CURRENT CLAMP	MN	MNFR	SN	ASSET	CAT	CALIBRATION DUE
TRUE-RMS MULTIMETER	79III	FLUKE	71700298	00769	I	25-OCT-2006
TRUE-RMS MULTIMETER (REFERENCE)	177	FLUKE	83390024	00973	I	21-MAR-2007
TRUE-RMS MULTIMETER	177	FLUKE	83390025	00974	I	10-MAR-2007
TRUE-RMS MULTIMETER (TELECOM)	177	FLUKE	83430419	00975	I	21-MAR-2007

SURGE GENERATORS	MN	MFR	SN	ASSET	CAT	CALIBRATION DUE
TRANSIENT WAVEFORM MONITOR	TWM-5	CDI	003982	00323	II	05-JUN-2007
UNIVERSAL SURGE GENERATOR	M5	CDI	003966	00324	II	OUT OF CAL
THREE PHASE COUPLING NWK	3CN	CDI	003455	00325	II	OUT OF CAL
1.2X50US PLUGIN MODULE	1.2X50US PLUGIN	CDI	N/A	00842	II	OUT OF CAL
10X160US PLUGIN MODULE	10X160US PLUGIN	C-S	N/A	00843	II	08-JUN-2007
10X560US PLUGIN MODULE	10X560US PLUGIN	C-S	N/A	00841	II	08-JUN-2007
PSURGE CONTROLLER MODULE	PSURGE 8000	HAEFELY	150267	00879	II	06-JUN-2007
COUPLING/DECOUPLING MODULE	PCD 900	HAEFELY	149213	00880	II	06-JUN-2007
IMPULSE MODULE	PIM 900	HAEFELY	149202	00881	II	06-JUN-2007
HIGH VOLTAGE CAP NWK 5KVDC, 18µF	CS-HVCC	C-S	01	00772	II	28-SEP-2006
NEBS SURGE GENERATOR	N/A	C-S	N/A	00088	II	06-JUN-2007
2X10US SURGE GENERATOR	2X10US	C-S	N/A	00846	II	06-JUN-2007
10X700US SURGE GENERATOR	10X700US	C-S	N/A	00847	II	08-JUN-2007
12 PAIR SURGE RESISTOR MODULE	N/A	C-S	N/A	00768	II	30-SEP-2006

POWER/NOISE METERS	MN	MFR	SN	ASSET	CAT	CALIBRATION DUE
POWER METER	435B	HP	2445A11012	00773	I	12-APR-2007
POWER METER	437B	HP	2912A01367	01099	I	12-APR-2007
POWER SENSOR	8481A	HP	2702A61351	00774	I	12-APR-2007
PSOPHOMETER	2429	BRUEL & KJAER	1237642	00585	II	14-FEB-2007
TRANSMISSION LINE TESTER (DBRNC)	185T	AMREL	998658	00823	II	16-MAR-2007

OVERVOLTAGE CHAMBERS	MN	MFR	SN	ASSET	CAT	CALIBRATION DUE
72KW POWER FAULT SIMULATOR	OV1	C-S	N/A	00792	II	31-MAR-2007
POWER FAULT SIMULATOR	OV2	C-S	N/A	00116	II	31-MAR-2007

DIPOLE TAPE MEASURES	MN	MFR	SN	ASSET	CAT	CALIBRATION DUE
26FT TAPE #1	2338CME	LUFKIN	C3166-1	00776	I	13-MAR-2007
26FT TAPE #2	2338CME	LUFKIN	C3166-2	00777	I	13-MAR-2007

METEOROLOGICAL METERS	MN	MFR	SN	ASSET	CAT	CALIBRATION DUE
TEMP./HUMIDITY/ATM. PRESSURE GAUGE	7400 PERCEPTION II	DAVIS	N/A	00965	II	08-FEB-2007
TEMPERATURE /HUMIDITY GAUGE	THG-912	HUGER	4000562	00789	I	01-FEB-2007
WEATHER CLOCK (PRESSURE ONLY)	BA928	OREGON SCIENTIFIC	C3166-1	00831	I	02-FEB-2007

CONSUMABLES	SPEC.	MFR	STOCK/MN	ASSET	CAT	CALIBRATION DUE
NEBS CHEESECLOTH	26-28M/KG	ED&D	ACC-01	N/A	III	N/A
NEBS CARBON BLOCK	3-MIL-GAP 1KV SURGE	RELIABLE	3AB	N/A	III	N/A

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

Jurisdictional Labeling and Required Instruction Manual Inserts

FCC Requirements

Required Equipment Authorization for Device Type

Type of Device	Equipment Authorization Required
TV broadcast receiver	Verification
FM broadcast receiver	Verification
CB receiver	Declaration of Conformity or Certification
Superregenerative receiver	Declaration of Conformity or Certification
Scanning receiver	Certification
All other receivers subject to part 15	Declaration of Conformity or Certification
TV interface device	Declaration of Conformity or Certification
Cable system terminal device	Declaration of Conformity
Stand-alone cable input selector switch	Verification
Class B personal computers and peripherals	Declaration of Conformity or Certification
CPU boards and internal power supplies used with Class B personal computers	Declaration of Conformity or Certification
Class B personal computers assembled using authorized CPU boards or power supplies	Declaration of Conformity
Class B external switching power supplies	Verification
Other Class B digital devices & peripherals	Verification
Class A digital devices, peripherals & external switching power supplies	Verification
All other devices	Verification

FCC Required labeling for Verified Devices 47 CFR Part 15.19

Verified devices must have the following label permanently affixed in a location accessible to the user:

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

No distinction is made between Class A or Class B devices on the label.

When the device is so small or for such use that it is not practicable to place label on it, the information may be shall be placed in a prominent location in the instruction manual supplied to the user or, alternatively, shall be placed on the container in which the device is marketed.

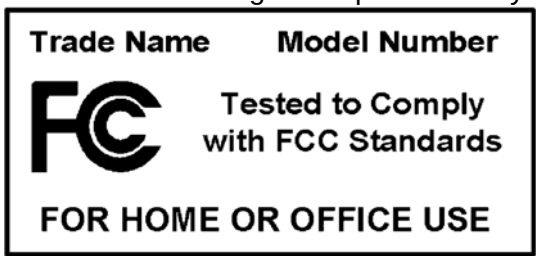
Where a device is constructed in two or more sections connected by wires and marketed together, the label is only required to be affixed to the main control unit.

FCC Required labeling for Class B Personal Computers and Peripherals Devices 47 CFR Part 15.19 subject to Declaration of Conformity

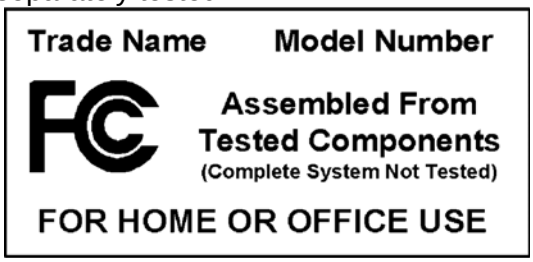
Personal computers and peripherals subject to authorization under a Declaration of Conformity shall be labeled as follows:

(1) The label shall be located in a conspicuous location on the device and shall contain the unique identification described in Section 2.1074 and the following logo:

(i) If the product is authorized based on testing of the product or system:



(ii) If the product is authorized based on assembly using separately authorized components and the resulting product is not separately tested:



(2) When the device is so small or for such use that it is not practicable to place the statement specified under paragraph (b)(1) of this section on it, such as for a CPU board or a plug-in circuit board peripheral device, the text associated with the logo may be placed in a prominent location in the instruction manual or pamphlet supplied to the user. However, the unique identification (trade name and model number) and the logo must be displayed on the device.

(3) The label shall not be a stick-on, paper label. The label on these products shall be permanently affixed to the product and shall be readily visible to the purchaser at the time of purchase, as described in Section 2.925(d). "Permanently affixed" means that the label is etched, engraved, stamped, silk-screened, indelibly printed, or otherwise permanently marked on a permanently attached part of the equipment or on a nameplate of metal, plastic, or other material fastened to the equipment by welding, riveting, or a permanent adhesive. The label must be designed to last the expected lifetime of the equipment in the environment in which the equipment may be operated and must not be readily detachable.

FCC Required Instruction Manual Inserts CFR 47 Part 15.21 and 15.105

The user's manual must caution the user that changes or modifications not expressly approved by the manufacturer could void the user's FCC granted authority to operate the equipment. In addition the following information should be inserted:

(a) For a Class A digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

Note: this equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

(b) For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- *Reorient or relocate the receiving antenna.*
- *Increase the separation between the equipment and receiver.*
- *Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.*
- *Consult the dealer or an experienced radio/TV technician for help.*

(c) The provisions of paragraphs (a) and (b) of this section do not apply to digital devices exempted from the technical standards under the provisions of § 15.103.

(d) For systems incorporating several digital devices, the statement shown in paragraph (a) or (b) of this section needs to be contained only in the instruction manual for the main control unit.

Conditions Of Testing

[Bureau Veritas Consumer Products Services, Inc., a Massachusetts corporation], and/or its affiliates (collectively, the "Company") will conduct, at the request of the Submitter ("**Client**"), the tests specified on the submitted Test Request Form or equivalent in accordance with, and subject to, the following terms and conditions (collectively, "**Conditions**"):

1. All orders for tests are subject to acceptance by the Company, and no order will constitute a binding commitment of the Company unless and until such order is accepted by it, as evidenced by the issuance of a written report ("**Test Report**") by the Company. The Test Report is issued solely by the Company, is intended for the exclusive use of Client and shall not be published, used for advertising purposes, copied or replicated for distribution to any other person or entity or otherwise publicly disclosed without the prior written consent of the Company. By submitting a request for services to the Company, Client consents to the disclosure to accreditation bodies of those records of Client relevant to the accreditation body's assessment of the Company's competence and compliance with relevant accreditation criteria. The Company shall not be liable for any loss or damage whatsoever resulting from the failure of the Company to provide its services within any time period for completion estimated by the Company. If Client anticipates using the Test Report in any legal proceeding, arbitration, dispute resolution forum or other proceeding, it shall so notify the Company prior to submitting the Test Report in such proceeding. The Company has no obligation to provide a fact or expert witness at such proceeding unless the Company agrees in advance to do so for a separate and additional fee.

2. The Test Report will set forth the findings of the Company solely with respect to the test samples identified therein. Unless specifically and expressly indicated in the Test Report, the results set forth in such Test Report are not intended to be indicative or representative of the quality or characteristics of the lot from which a test sample is taken, and Client shall not rely upon the Test Report as being so indicative or representative of the lot or of the tested product in general. The Test Report will reflect the findings of the Company at the time of testing only, and the Company shall have no obligation to update the Test Report after its issuance. The Test Report will set forth the results of the tests performed by the Company based upon the written information provided to the Company. The Test Report will be based solely on the samples and written information submitted to the Company by Client, and the Company shall not be obligated to conduct any independent investigation or inquiry with respect thereto.

3. The Company may, in its sole discretion, destroy samples which have been furnished to the Company for testing and which have not been destroyed in the course of testing. The Company may delegate the performance of all or a portion of the services contemplated hereunder to an affiliate, agent or subcontractor of the Company, and Client consents to such delegation.

4. These Conditions and the Test Report represent the entire understanding of the parties hereto with respect to the subject matter hereof and of the Test Report, and no modification, variance or extrapolation with respect thereto shall be permitted without the prior written consent of the Company.

5. The names, service marks, trademarks and copyrights of the Company and its affiliates, including the names "**BUREAU VERITAS**," "**BUREAU VERITAS CONSUMER PRODUCTS SERVICES**," "**BVCPS**", "**MTL**", "**ACTS**", "**MTL-ACTS**" and **CURTIS-STRAUS** (collectively, the "**Marks**") are and shall remain the sole property of the Company or its affiliates and shall not be used by Client except solely to the extent that Client obtains the prior written approval of the Company and then only in the manner prescribed by the Company. Client shall not contest the validity of the Marks or take any action that might impair the value or goodwill associated with the Marks or the image or reputation of the Company or its affiliates.

6. Payment in full shall be due 30 days after the date of invoice. Interest shall be due on overdue amounts from the due date until paid at an interest rate of 1.5% per month or, if less, the maximum rate permitted by law. The Company reserves the right, at any time and from time to time, to revoke any credit extended to Client. Client shall reimburse the Company for any costs it incurs in collecting past due amounts, including court costs and fees and expenses of attorneys and collection agencies. The Test Report may not be used or relied upon by Client if and for so long as Client fails to pay when due any invoice issued by the Company or any affiliate of it to Client or any affiliate or subsidiary of Client together with interest and penalties, if any, accrued thereon.

7. The Company disclaims any and all responsibility or liability arising out of or in connection with e-mail transmissions of such information.

8. Client understands and agrees that the Company is neither an insurer nor a guarantor, that the Company does not take the place of Client or any designer, manufacturer, agent, buyer, distributor or transportation or shipping company, and that the Company disclaims all liability in such capacities. Client further understands that if it seeks assurance against loss or damage, it should obtain appropriate insurance.

9. Client agrees that the Company, by providing the services, does not take the place of Client nor any third party, nor does the Company release them from any of their obligations, nor does the Company otherwise assume, abridge, abrogate or undertake to discharge any duty of any third party to Client or any duty of Client or any third party to any other third party, and Client will not release any third party from its obligations and duties with respect to the tested goods.

10. Client shall, on a timely basis, (a) provide adequate instructions to the Company in order to enable the Company to perform properly its services, (b) provide, or cause Client's suppliers and contractors to provide, the Company with all documents necessary to enable the Company to perform its services, (c) furnish the Company with all relevant information regarding Client's intended use and purposes of the tested goods, (d) advise the Company of essential dates and deadlines relevant to the tested goods and (e) fully exercise all rights and remedies available to Client against third parties in respect of the tested goods.

11. The Company shall undertake due care and ordinary skill in the performance of its services to Client, and the Company shall accept responsibility only were such skill has not been exercised and, even in such event, only to the extent of the limitation of liability set forth herein.

12. If Client desires to assert a claim arising from or relating to (i) the performance, purported performance or non-performance of any services by the Company or (ii) the sale, resale, manufacture, distribution or use of any tested goods, it must submit that claim to the Company in a writing that sets forth with particularity the basis for such claim within 60 days from discovery of the potential claim and not more than six months after the date of issuance of the Test Report to Client. Client waives any and all such claims including, without limitation, claims that the Test Report is inaccurate, incomplete or misleading or that additional or different testing is required, unless and then only to the extent that Client submits a written claim to the Company within both such time periods.

13. CLIENT SHALL, EXCEPT TO THE EXTENT OF COMPANY'S LIABILITY TO CLIENT HEREUNDER (WHICH IN NO EVENT SHALL EXCEED THE LIMITATION OF LIABILITY HEREIN), HOLD HARMLESS AND INDEMNIFY THE COMPANY, ITS

AFFILIATES AND THEIR RESPECTIVE DIRECTORS, OFFICERS, EMPLOYEES, AGENTS AND SUBCONTRACTORS AGAINST ALL ACTUAL OR ALLEGED THIRD PARTY CLAIMS FOR LOSS, DAMAGE OR EXPENSE OF WHATSOEVER NATURE AND HOWSOEVER ARISING FROM OR RELATING TO (i) THE PERFORMANCE, PURPORTED PERFORMANCE OR NON-PERFORMANCE OF ANY SERVICES BY THE COMPANY OR (ii) THE SALE, RESALE, MANUFACTURE, DISTRIBUTION OR USE OF ANY TESTED GOODS.

14. EXCEPT AS MAY OTHERWISE BE EXPRESSLY AGREED TO IN WRITING BY THE COMPANY AND NOTWITHSTANDING ANY PROVISION TO THE CONTRARY CONTAINED HEREIN OR IN ANY TEST REPORT, NO WARRANTY OR GUARANTEE, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USE, IS MADE.

15. (A) IN NO EVENT WHATSOEVER SHALL THE COMPANY BE LIABLE FOR ANY CONSEQUENTIAL, SPECIAL, INCIDENTAL, EXEMPLARY OR PUNITIVE DAMAGES IN CONNECTION WITH, RELATING TO OR ARISING OUT OF THE TEST REPORT OR THE SERVICES PROVIDED BY THE COMPANY HEREUNDER, INCLUDING WITHOUT LIMITATION LOSS OF OR DAMAGE TO PROPERTY; LOSS OF INCOME, PROFIT OR USE; OR ANY CLAIMS OR DEMANDS MADE AGAINST CLIENT OR ANY OTHER PERSON BY ANY THIRD PARTY IN CONNECTION WITH, RELATING TO OR ARISING OUT OF THE SERVICES PROVIDED BY THE COMPANY HEREUNDER.

(B)NOTWITHSTANDING ANY PROVISION TO THE CONTRARY CONTAINED HEREIN, AND IN RECOGNITION OF THE RELATIVE RISKS AND BENEFITS TO CLIENT AND THE COMPANY ASSOCIATED WITH THE TESTING SERVICES CONTEMPLATED HEREBY, THE RISKS HAVE BEEN ALLOCATED SUCH THAT UNDER NO CIRCUMSTANCES WHATSOEVER SHALL THE LIABILITY OF THE COMPANY TO CLIENT OR ANY THIRD PARTY IN RESPECT OF ANY CLAIM FOR LOSS, DAMAGE OR EXPENSE, OF WHATSOEVER NATURE OR MAGNITUDE, AND HOWSOEVER ARISING, EXCEED AN AMOUNT EQUAL TO FIVE (5) TIMES THE AMOUNT OF THE FEES PAID TO THE COMPANY FOR THE SPECIFIC SERVICES WHICH GAVE RISE TO SUCH CLAIM OR U.S.$10,000, WHICHEVER IS THE LESSER AMOUNT.

16. The Company shall not be liable for any loss or damage resulting from any delay or failure in performance of its obligations hereunder resulting directly or indirectly from any event of force majeure or any event outside the control of the Company. If any such event occurs, the Company may immediately cancel or suspend its performance hereunder without incurring any liability whatsoever to Client.

17. Company's services, including these Conditions, shall be governed by, and construed in accordance with, the local laws of the country where the Company performs the tests or, in the case of tests performed in the United States of America, the laws of Massachusetts without regard to conflicts of laws principles. If any aspect(s) of these Conditions is found to be illegal or unenforceable, the validity, legality and enforceability of all remaining aspects of these Conditions shall not in any way be affected or impaired thereby. Any proceeding related to the subject matter hereof shall be brought, if at all, in the courts of the country where the Company performs the tests or, in the case of tests performed in the United States of America, in the courts of Massachusetts. Client waives the right to interpose any counterclaim or setoffs of any nature in any litigation arising hereunder.

Rev.160009121(2)_#684340 v13CS

A2LA Accreditation

SCOPE OF ACCREDITATION TO ISO/IEC 17025-1999

CURTIS-STRAUS[1]
527 Great Road
Littleton, MA 01460
Barry Quinlan Phone: 978-486-8880
ELECTRICAL

Valid until: July 31, 2007 Certificate Number: 1627.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following Electromagnetic Compatibility (EMC), Telecommunications, and Product Safety tests:

Electromagnetic Compatibility (EMC)
Radiated emissions testing (electric and magnetic fields)*; Conducted emissions testing (voltage and current)*; Electrostatic Discharge testing*; Electrical Fast Transient testing*; Radiated Immunity testing*; Conducted Immunity testing*; Lightning Immunity testing*; Voltage Dips*, Interrupts and Voltage Variations testing*; Magnetic Immunity testing*; RF Power measurements*; Frequency Stability Measurements*; Longitudinal Induction measurements*; Harmonic emissions testing*; Light flicker testing*; Low frequency disturbance voltage testing*; Disturbance Power measurements*; Power Cross Overvoltage testing*;

Test Type	Test Method(s)
Emissions	
Radiated and Conducted Emissions	FCC 47 CFR Parts 15 & 18; C63.4; CISPR 22; EN55022; SABS CISPR 22; AS/NZS CISPR 22; AS/NZS 3548; Canada ICES-003; CNS13438; KN 22 (RRL No. 2005-82, September 29, 2005); CISPR 11; EN 55011; SABS CISPR 11; AS/NZS CISPR 11; AS/NZS 2064; Canada ICES-001; CNS13803; CISPR 13; EN 55013; SABS CISPR 13; AS/NZS CISPR 13; AS/NZS 1053; CISPR 14-1; EN 55014-1; SABS CISPR 14; AS/NZS CISPR 14; AS/NZS 1044; CNS 13439; CISPR 15; EN 55015; GR-1089-CORE; CSA C108.8-M1983;
Harmonics	EN 61000-3-2; AS/NZS 61000.3.2
Flicker	EN 61000-3-3; AS/NZS 61000.3.3

1 Note: This accreditation covers testing performed at the laboratory listed above and the satellite facility located at 168 Ayer Rd, Littleton, MA 01460 and, for test types marked with an asterisk, at other sites as defined in *"A2LA specific criteria for the accreditation of site testing and site calibration laboratories."*

Immunity	RRL No. 2005-130 (December 27, 2005)
Electrostatic Discharge (ESD)	EN 61000-4-2; AS/NZS 61000.4.2; KN61000-4-2
Radiated Immunity (RFI)	EN 61000-4-3, AS/NZS 61000.4.3; KN61000-4-3
Electrical Fast Transient Bursts (EFT)	EN 61000-4-4; AS/NZS 61000.4.4; KN61000-4-4
Surge	EN 61000-4-5, AS/NZS 61000.4.5; KN61000-4-5
Conducted Immunity	EN 61000-4-6, AS/NZS 61000.4.6; KN61000-4-6
Magnetic Immunity	EN 61000-4-8; AS/NZS 61000.4.8; KN61000-4-8
Voltage Dips and Interrupts	EN 61000-4-11; KN61000-4-11
Low Frequency Conducted Disturbances	EN 61000-2-2

Family Product or Industry Specific Specifications *including emissions and/or immunity*	GR-1089-CORE; GR-78-CORE (ESD) EN50081-1; EN50081-2; EN50082-2; EN50082-1; EN 61000-6-1; EN 61000-6-2; EN 61000-6-3; EN 61000-6-4; EN 50091-2; EN 55024; CISPR 24 EN 55103-1; EN 55103-2; EN 61326; EN 61547; EN 50130-4; EN 50083-2; EN 60601-1-2; EN 60601-2-2; EN 60601-2-24; EN 60601-2-32; EN 60601-2-38; EN 60601-2-47; IEC 1800-3; EN 61800-3; EN 55020; CISPR 20; EN 60555 Part 2; EN 60555 Part 3; ETS 300 386-1; EN 300 386-2; EN 300 386, ETS 300 132-1; ETS 300 132-2; EN 60669-2-1; AS/NZS 3200.1.2; CNS 13783-1; ETR 283; C62.41
Radiocommunications	
EU R&TTE Radio Standards;	EN 300 220-1; EN 300 220-3; EN 300 330-1; EN 300 330-2; EN 300 440-1; EN 300 440-2; EN 300 328; EN 300 385; EN 301 893
EU R&TTE EMC Standards	EN 300 339; EN 301 489-01; EN 301 489-03; EN 301 489-17
Canada Radio Standards	RSS-102; RSS-117; RSS-118; RSS-119; RSS-123; RSS-125; RSS-128; RSS-129; RSS-130; RSS-131; RSS-132; RSS-133; RSS-134; RSS-135; RSS-136; RSS-137; RSS-138; RSS-141; RSS-142; RSS-170; RSS-181; RSS-182; RSS-187; RSS-188; RSS-191; RSS-192; RSS-193; RSS-195; RSS-210; RSS-212; RSS-213; RSS-215; RSS-243; RSS-GEN; RSS-310; GL-36;
Australia/New Zealand Radio Standards	AS/NZS 4268; AS/NZS 4771; RFS29; Radiocommunications (Data Transmission Equipment Using Spread Spectrum Modulation Techniques); Radiocommunications (Spread Spectrum Devices); Radiocommunications (Short Range Devices); Radiocommunications (Low Interference Potential Devices);

Other Radio Standards	RTTE 01 (DGT-Taiwan);

FCC Standards and Test methods Support TCB Status--	
FCC Scope A – Unlicensed Radio Frequency Devices	
A1	1. 47 CFR Parts 11, 15 and 18 2. FCC MP-5, 3. ANSI C63.4-2003,
A2	1. 47 CFR Part 15, 2. ANSI C63.4-2003,
A3	1. 47 CFR Part 15, 2. ANSI C63.17-1998, 3. ANSI C63.4-2003,
A4	1. 47 CFR Part 15, 2. ANSI C63.4-2003,
FCC Scope B – Licensed Radio Service Equipment	
B1	1. 47 CFR Parts 2, 22, 24, 25, and 27 2. ANSI/TIA-603-C (2004)
B2	1. 47 CFR Parts 2, 22, 74, 90, 95, and 97 2. ANSI/TIA-603-C (2004)
B3	1. 47 CFR Parts 2, 80, and 87 2. ANSI/TIA-603-C (2004)
B4	1. 47 CFR Parts 2, 21, 74, and 101 2. ANSI/TIA-603-C (2004)

Country Specific Standards and Other	
ITU EMC Standards	K.20; K.21; K.41; K.44
Swedish EMC Standards	BAKOM 3336.3
South African EMC Standards other then CISPR equivalents	SABS 1718-1; SANS 211/SABS CISPR 11; SANS 224/SABS CISPR 24; SANS 213/SABS CISPR 13; SANS 2200; SANS214-1/SABS CISPR 14-1; SANS214-2/SABS CISPR 14-2; SANS 215/SABS CISPR 15; SANS 222/SABS CISPR 22
Hong Kong EMC Standards	HKTA 1006; HKTA 1007; HKTA 1008; HKTA 1010; HKTA 1015; HKTA 1026; HKTA 1035; HKTA 1039; HKTA 1041; HKTA 1042; HKTA 1045
Singapore EMC Standards	IDA TS SRD; IDA TS EMC
Japanese VCCI Standards	VCCI V-3, VCCI V-4

Telecommunications
Telecommunications Registration; General test methods; Lightning surge*; Drop testing*; Balance testing*; Signal power (metallic and longitudinal)*; Frequency measurements*; Pulse templates*; Leakage testing*; Impedance testing*; Hearing Aid Compatibility testing (*excluding volume control*)*; Protocol analysis* and Jitter testing*.

Telecom Standards	Title
North American standards	
FCC 47 CFR Part 68 Telephone Terminal Equipment	Connection of terminal equipment to the telephone network. Analog and Digital Equipment. TCB Scope C1.
CS-03 Issue 9	Specification for terminal equipment, terminal systems, Network protection devices, connection arrangements and hearing aids compatibility.
TIA/EIA TSB31-B 1998	Bulletin Part 68 Rationale and Measurement Guidelines (Feb 1998)
TIA-968-A, A1, A2, A3	Telecommunications Telephone Terminal Equipment Technical Requirements for Connection of Terminal Equipment to the Telephone Network
T1.TRQ.6-2001	Technical Requirements for SHDSL, HDSL2, HDSL4 Digital Subscriber Line Terminal Equipment to Prevent Harm to the Telephone Network Industry
Australia standards	
AS/ACIF S002-2001	Analogue interworking and non-interference requirements for Customer Equipment for connection to the Public Switched Telephone Network
AS/ACIF S016-2001	Requirements for Customer Equipment for connection to hierarchical digital interfaces
AS/ACIF S031-2001	Requirements for ISDN Basic Access Interface
AS/ACIF S038-2001	Requirements for ISDN Primary Rate Access Interface
AS/ACIF S043-2001	Requirements for Customer Equipment for Connection to a Metallic Local Loop Interface of a Telecommunications Network — Part 1: General Part 2: Broadband Part 3: DC, Low Frequency AC and Voice band
International standards	
ITU-T G.703	Physical/electrical characteristics of hierarchical Digital interfaces
Hong Kong standards	
HKTA 2011	Network Connection Specification for Connection of Customer Premises Equipment (CPE) to Direct Exchange Lines (DEL) of the Public Switched Telephone Network (PSTN) in Hong Kong
HKTA 2014	Network Connection Specification for Connection of Customer Premises Equipment (CPE) to the Public Telecommunications Network (PTN) in Hong Kong using ISDN Basic Rate Access (BRA) based on ITU-T Recommendations

Telecom Standards	Title
HKTA 2028	Network connection specification for connection of CPE to the PTNs in Hong Kong using digital leased circuits at data rate of 1544 kbit/s
HKTA 2029	Network connection specification for connection of CPE to the PTNs in Hong Kong using digital leased circuits at data rate of 2048 kbit/s
HKTA 2030	Network Connection Specification for Connection of Customer Premises Equipment (CPE) to the Public Telecommunications Network (PTN) in Hong Kong using Digital Leased Circuits at nx64 kbit/s
HKTA 2031	Network Connection Specification for Connection of Customer Premises Equipment (CPE) to the Public Telecommunications Network (PTN) in Hong Kong using Digital Leased Circuits below 64 kbit/s
HKTA 2032	Network Connection Specification for Connection of Customer Premises Equipment (CPE) to the Public Telecommunications Networks in Hong Kong using Asymmetric Digital Subscriber Lines (ADSL) based on ITU-T Recommendation G.992.1
HKTA 2033	Network Connection Specification for Connection of Customer Premises Equipment (CPE) to Fixed Telecommunications Networks in Hong Kong using Splitterless Asymmetric Digital Subscriber Lines (ADSL) based on ITU-T Recommendation G.992.2
European standards	
TBR 1: 1995	Attachment requirements for terminal equipment to Be connected to circuit switched data networks and Leased circuits using a CCITT Recommendation X.21 interface, or at an interface physically, functionally and electrically compatible with CCITT Recommendation X.21 but operating at any data signaling rate up to, and including, 1 984 kbit/s
TBR 2: 1997	Attachment requirements for Data Terminal Equipment (DTE) to connect to Packet Switched Public Data Networks (PSPDNs) for CCITT Recommendation X.25 interfaces at data signaling rates up to 1 920 kbit/s utilizing interfaces derived from CCITT Recommendations X.21 and X.21 bit
TBR 3: 1995 + Amdt : 1997	Integrated Services Digital Network (ISDN); Attachment requirements for terminal equipment to connect to an ISDN using ISDN basic access
TBR 4: 1995 + Amdt : 1997	Integrated Services Digital Network (ISDN); Attachment requirements for terminal equipment to connect to an ISDN using ISDN primary rate access
TBR 012: 1993 + Amdt : 1996	Business Telecommunications (BT); Open Network Provision (ONP) technical requirements; 2 048 kbit/s digital unstructured leased line (D2048U) Attachment requirements for terminal equipment
TBR 013: 1996	Business TeleCommunications (BTC); 2 048 kbit/s digital structured leased lines (D2048S); Attachment requirements for terminal equipment interface

European standards (cont'd)	
TBR 21: 1998	Terminal Equipment (TE); Attachment requirements For pan-European approval for connection to the Analogue Public Switched Telephone Networks (PSTNs) of TE (excluding TE supporting the voice telephony service) in which network addressing, if provided, is by means of Dual Tone Multi Frequency (DTMF) signaling
TBR 24: 1997	Business TeleCommunications (BTC); 34 Mbit/s Digital Unstructured and structured leased lines (D34U and D34S); Attachment requirements for Terminal equipment interface
Taiwan standards (DGT)	
ADSL01	Asymmetric Digital Subscriber Line Terminal Equipment and POTS Splitter Technical Specifications
ID0002	DS1 Equipment Type Approval Guidelines
IS6100	ISDN Terminal Equipment Technical Specifications
PSTN01 (non-voice only)	Technical Specifications for Terminal Equipment for Connection to Public Switched Telephone Network
New Zealand standards	
PTC 200 (non-voice only)	Requirements for Connection of Customer Equipment to Analogue Lines
PTC 217	Requirements for Bandwidth Management Devices
TNA 117	Telecom 2048 kbit/s Standard Network Interface
PTC 270	Interim arrangements for ADSL CPE
Singapore Standards	
IDA TS ADSL	Type Approval Specification for Asymmetric Digital Subscriber Line (Full-rate ADSL) Modems
IDA TS ADSL 2	Type Approval Specification for Asymmetric Digital Subscriber Line Splitterless (G-Lite) Modems
IDA TS DLCN 1	Type Approval Specification for Digital Interfaces based on hierarchical bit rates of 2048 kbit/s, 34 368 kbit/s and 139 264 kbit/s
IDA TS ISDN 1	Type Approval Specification for connection of Terminal Equipment to Integrated Services Digital Network (ISDN) Basic Access
IDA TS ISDN 2	Type Approval Specification for connection of Terminal Equipment to Integrated Services Digital Network (ISDN) Primary Rate Access (PRA)
IDA TS PSTN (non-voice only)	Type Approval Specification for connection of Terminal Equipment to Public Switched Telephone Network (PSTN)
South Africa standards	
TE-001 (non-voice only)	Standard for Telecommunication Line Terminal Equipment (TLTE) for Connection to the Public Switched Telephone Network (PSTN)

Product Safety
General test methods:
Power input*, Permanence of marking*, Accessibility*, Permissibly limits*, Energy hazard measurement*, SELV circuits*, TNV limits*, Limited current*, Capacitor Discharge / voltage limitation*, Ring signal*, Humidity conditioning*, Creepage / Clearance / Distance thru Insulation (excluding CTI)*, Limited power measurement*, Ground Bond/Earthing*, Ground continuity*, Temperature*, Stability*, Applied force*, Steel sphere impact*, Mold stress*, Battery reverse current*, Ball pressure*, Leakage current*, Component abnormal*, Electric strength*, Impulse*, Overvoltage*, Acoustic sound pressure*, 130mm / 20mm flame*, Needle flame*, Hot flaming oil*, Locked rotor/motor armature*, Vibration, Bump, Drop*, Strain relief*, Torque*, Insulation resistance*, Sound level*, Handle loading*, Liquid overflow*, Spillage*, Liquid leakage*, Transformer shorts/overloads*, Rain test*, Wall mount*, Laser radiation (excluding x-ray)*, Voltage surge*, Functionality*, Protective impedance abnormal*, Capacitor short circuit abnormal*, Output abnormal*, Multi-supply abnormal*, Cooling abnormal*, Heating device abnormal*, Interlock abnormal*, Rigidity*, Cleaning*

Product Safety Standards	Title
Specific Product Safety Standards	
UL 60950 2000	Safety of information technology equipment
IEC 60950 1999	Safety of information technology equipment
EN 60950 2000	Safety of information technology equipment, including
IEC 60950-1 2001	Electrical business equipment.
UL 60950-1 2003	
CSA C22.2 No. 60950-00	
CSA C22.2 No. 60950-1 03	
IEC 61010-1 1993	Safety requirements for electrical equipment for measurement, control and laboratory use, Part 1: General requirements.
EN 61010-1 1993, 2001	Safety requirements for electrical equipment for measurement,
IEC 61010-1 2001	control and laboratory use, Part 1: General requirements.
UL 61010B-1 2003	
CAN/CSA 1010-1 1999 (*Including AM 2*)	Electrical equipment for laboratory use Part 1: General requirements.
IEC 60601-1 1995	Medical electrical equipment. Part 1: General requirements for safety.
EN 60601-1 1995 (*Including AM 2*)	Medical electrical equipment
UL 2601-1 1997	Medical electrical equipment. Part 1: General Requirements for safety.
IEC 60065 1998, 2000	Audio, video and similar electronic apparatus – Safety requirements
ANSI/UL 6500: 1998	Audio/video and musical instrument apparatus for Household,
CAN/CSA 60065-00	commercial and similar general use Australian/New Zealand
AS/NZS 60065 2000	Standard – Approval and test Specification – Mains operated electronic and related Equipment for household and similar general use
Canadian C22.2 No. 1-94 (1-98)	Audio, video and similar electronic equipment.
1994, 1998	Consumer and commercial products
EN 60065 1994	Safety requirements for main operated electronic and related apparatus for household and similar general use.
IEC 60825 1990	Radiation safety of laser products, equipment Classification, requirements and user's guide
EN 60825-1 1994	Safety of laser products Part 1: equipment

Product Safety Standards	Title
IEC 60825-1 2001	Classification, requirements and user's guide.
IEC 60825-2 2000-5	Safety of laser products – Part 2: Safety of optical communication systems
IEC 60825-4 1997-11	Safety of laser products – Part 4: Laser guards
21 CFR 1040.10	Performance standard for laser products
IEC 60335-1 1995	Safety of household and similar electrical appliances
(*Including AM2 – 1997 & AM 12 – 1997*)	Part 1: General requirements
EN 60335-1 2001	
UL 60335-1 1998	
CAN/CSA E335-1 1994	
UL 61010A-1: 2002	Electrical equipment for laboratory use; part 1: General requirements
EN 61010-1: 2001	Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements
AS/NZS 60950: 2000	Safety information technology equipment
EN 60950-1: 2001	Information Technology Equipment – Safety – Part1: General Requirements
AS/NZS 60950.1: 2003	Information Technology Equipment – Safety – General requirements
UL 61010 -1: 2004	Electrical Equipment for Measurement, Control and Laboratory Use; Part 1: General Requirements
UL 60601-1: 2003	Medical Electrical Equipment, Part 1: General Requirements for Safety
IEC 60601-1-1: 2000	Medical Electrical Equipment - Part 1: General Requirements For Safety 1: Collateral Standard: Safety Requirements For Medical Electrical Systems
EN 60601-1-1: 2001	Medical Electrical Equipment - Part 1: General Requirements for Safety – Section 1-1. Collateral Standard: Safety Requirements For Medical Electrical Systems
UL 60065: 2003	Audio, Video and Similar Electronic Apparatus – Safety Requirements
CSA 60065: 2003	Audio, Video and Similar Electronic Apparatus – Safety Requirements
IEC 60065: 2001	Audio, Video and Similar Electronic Apparatus – Safety Requirements
EN 60065: 2002	Audio, Video and Similar Electronic Apparatus – Safety Requirements
EN 60204 -1: 1998	Safety of Machinery – Electrical Equipment of Machines – Part 1: Specification for General Requirements
HKTA 2001	Compliance Test Specification – Safety and Electrical Protection Requirements for Subscriber Equipment Connected to the Public Telecommunications Networks In Hong Kong

Environmental Simulation

Test Technology	Test Standard	Supporting Standards
Accessibility*	IEC 60529	IP-0x thru IP-6x
Acoustic Noise*	GR-63-CORE Sec 4.6	
Airborne Contaminants	GR-63-CORE Sec 4.5	MFG & Hygroscopic Dust
Altitude	GR-63-CORE Sec 4.1.3	
Cold Start*	ETS 300 019	IEC 60068-2-1
Drip	IEC 60529	IP-x1 & IP-x2
Drops*	ETS 300 019	IEC 60068-2-32
	GR-63-CORE Sec 4.3	
Dust	IEC 60529	IP-5x & IP-6x
Firearms Resistance Testing	GR-487	
Fire Resistance	ANSLT1.319	
	GR-63-CORE Sec 4.2	Fire & Needle Flame
Heat Dissipation*	GR-63-CORE Sec 4.1.4	
Illumination	GR-63-CORE Sec 4.7	
Operational Temperature & Humidity (OpTH)*	ETS 300 019	IEC 60068-2-1 IEC 60068-2-2 IEC 60068-2-14 IEC 60068-2-56
	GR-63-CORE Sec 4.1.2	
Salt Fog & Spray	ASTM B117	
Spatial*	GR-63-CORE Sec 2.0 & 3.0	
Spraying-Splashing	IEC 60529	IP-x3 & IP-x4
Storage (Temperature & Humidity)*	ETS 300 019	IEC 60068-2-1 IEC 60068-2-2 IEC 60068-2-14 IEC 60068-2-30 IEC 60068-2-56
	GR-63-CORE Sec 4.1.1	
Vibration	ETS 300 019	IEC 60068-2-6 IEC 60068-2-27 IEC 60068-2-29 IEC 60068-2-32 IEC 60068-2-57 IEC 60068-2-64 Earthquake, Office &
	GR-63-CORE Sec 4.4	Transportation
Water Immersion	IEC 60529	IP-x7 & IP-x8
Water Jet	IEC 60529	IP-x5 & IP-x6

Note 1. For standards or methods listed on the scope of accreditation without a revision date, laboratories are expected to be competent in the use of the current version within one year of the date of publication of the standard test method or upon the date specified by the standard test method originator when the originator has implementation authority. When a superseded standard or method is required for an accredited test, the scope will include the superseded date/version. For those that support the TCB/CB status of the organization acting as a certifier on behalf of the FCC or IC the expectation is currency within 30 days of Federal Register publication of changes for FCC and 30 days after IC website update. This note shall not be construed as an Accreditation Body implication to adopt a more current standard than is required in a regulation or code (i.e. the legal requirement) which is adopted by the lab under their responsibility.

* On-site test service is available for this technology, test, or method.